

A REVISION OF THE CHALCID-FLIES OF THE GENUS HARMOLITA¹ OF AMERICA NORTH OF MEXICO.

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INTRODUCTION.

As the genus *Harmolita* (*Isosoma* of authors) includes some species of very great economic importance the writers have made this detailed study of it in order that it may be possible to identify material with certainty in the future.

The genus, as it is known to the writers now, embraces 29 species, 17 of which are new to science. The biology of the different members of the genus has been studied as far as possible in connection with the structural characters, with the result that a number of new species has been added, while some of the old ones must pass into synonymy. Some species whose biology is only partly known or wholly unknown may have to be split up further when more is learned about their life histories, since the writers have erected new species only where it seemed absolutely necessary.

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METHODS OF STUDY.

As has been previously stated, upon taking up the study of this group, it was decided to approach the problem from the biological

¹ Order Hymenoptera. Family Eurytomidae.

side first. It therefore seemed necessary to rear each species separately, under confinement. To accomplish this the different species of grass and grain stems that were found to be infested were carefully isolated. Upon closer examination, however, it was learned that there were often two distinct types of injury upon the same species of plant. Larvae were found occupying distinct warty or gall-like distortions along the stems and others were found in the center of the stems, just at the nodes. These were then separated according to the manner of injury to the plant and each kind isolated. Upon the emergence of adults, individuals from each source were confined upon healthy growing plants of the same species from which they had been taken. The writers found that each lot of individuals continued to breed in the same manner, either always inhabiting the center of the stem or forming galls, as the case might be. The experiments then proceeded a step further; each gall-inhabitor from a given plant was tried on a series of different hosts. This same method was also used for those that inhabited the center of the stems. The results of these tests over a number of years proved that, with a few exceptions, each species steadily refused to accommodate itself to a strange host.

Unfortunately the writers have been unable to rear in confinement all species dealt with in this paper, and they have never even had the pleasure of observing living specimens of *poophila*, *agropyrocola*, *agrostidis*, *bromicola*, *elymophila*, *elymozena*, and *gillettei*.

There are five species that seem to be distinctly western and have steadily refused to breed here in the Eastern States. These are *ovata*, *rufipes*, *hesperus*, *occidentalis*, and *elymophthora*. On the other hand, there are 10 species that have never been taken west of the western boundary of Missouri, namely, *tritici*, *secalis*, *hordei*, *poae*, *captiva*, *dactylicola*, *festucae*, *atlantica*, *elymicola*, and *maculata*. The remaining seven species, *vaginicola*, both forms of *grandis*, *websteri*, *albomaculata*, and *elymi*, are found very nearly all over the United States where their hosts normally occur; *elymivora* and *agropyrophila* have been found as far west as Kansas.

After breeding had apparently definitely established the distinctness of a species, it was studied carefully for structural characters upon which to differentiate it. The saws or ovipositors seemed to offer the most secure basis, in that there was less variation in this character and the differences were often quite striking.

After mounting the ovipositors of all species at hand it was found that a few species were so close that there was difficulty in separating them on this character alone. A careful study of external characters at this stage showed that every species could be readily identified on groups of characters based on external structure. Therefore the analytical tables given herewith are based exclusively on the

external structure. The saws or ovipositors of every species, except one (*agrostidis*), are illustrated, however, so that, whenever necessary, they may be used as a last resort, for identifying a species. There are so few specimens of *agrostidis* that it seemed inadvisable to mutilate any of them. No descriptions have been drawn up for the ovipositors, since it seemed utterly useless. There is little difference in the ovipositors of the different species as seen in profile; the main difference is in the dorsal view and consists in size, shape, and arrangement of denticles.

There are two more or less distinct types of ovipositors, as will readily be seen by referring to plates I, II, and III. These two types of ovipositors bear a distinct relation to the type of injury inflicted upon the plant by the insect and are also coordinated with the external structure or sculpturing of the thorax. In other words, one is able to determine definitely, with one exception, whether a species inhabits the center of the stem or whether it is a gall-former, by a glance at the ovipositor or the sculpturing of the thorax of the species in question. All gall-formers, with the exception of *captiva*, have the rugulose praescutum (pl. 42, fig. 1) and ovipositors of the general type illustrated in plate 41, with denticles on the rods, while those that inhabit the center of the stem have the reticulate praescutum (pl. 42, fig. 2) and the ovipositors of the general type represented by plate 39, figure 2, without denticles on the rods. The exception, *captiva*, is apparently more closely related to the species that inhabit the center of the stem.

Tables for the identification of both males and females are included, though the males can not always be identified with certainty. Besides, there are a number of species in which males rarely occur, so that, on the whole, identifying a species from males alone is unsatisfactory.

The ovipositors may be mounted most easily from freshly killed specimens, though they may readily be mounted from dried specimens also by dropping the abdomen in a hot, concentrated solution of potassium or sodium hydrate for a few minutes. The ovipositors may then be dissected out as in fresh specimens, dehydrated in alcohol, cleared in carbol-zylol and mounted in Canada balsam.

Genus HARMOLITA Motschulsky.

Isosoma WALKER, Ent. Mag., vol. 1, 1832, p. 13. (Not *Isosoma* Billberg, 1820, Coleoptera). (Type, *Ichneumon verticillata* Fabricius.)

Harmolita MOTSCHULSKY, Bull. soc. nat. Moscow, vol. 35, 1863, p. 58. (Type, *H. longicornis* Motschulsky.)

Philachyra (Haliday) WALKER, Notes on Chalcid., pt. 1, 1871, p. 7.

The writers have restricted the genus *Harmolita* to those species without a carinate occiput and having the praescutum either smoothly reticulate and shining (as in *grandis*), reticulately lineolate

(as in *maculata* (pl. 42, fig. 2)), reticulately lineolate with shallow, irregularly placed, indefinite punctures (as in *captiva*) or rugose (as in *tritici* (pl. 42, fig. 1)). This excludes all species having the carinate occiput or an even, distinct, umbilicate punctation on the praescutum and other portions of the thorax, even though the punctation be faint. The genus thus restricted excludes Howard's species, *hageni*, *bromi*, and *californicum*, and Ashmead's *abnorme*, *montanum*, and *nevadense*, all of which belong to the Eurytomines. The senior writer has examined the types of these excluded species. Nothing is known of their life history.

GLOSSARY.

Annulations=The rings or elevations on the distal extremity of the flagellar joints of the antennae of some males (pl. 47, figs. 1, 7, 8).

Groove=The longitudinal, margined depression or groove down the center of the propodeum (pl. 43, fig. 3).

Spiracular carinae=The carinae that curve around from the groove or from near the center of the propodeum to the spiracles (pl. 43, fig. 2).

TABLE 1.—FEMALES.

- | | |
|--|-----------------------------------|
| 1. Praescutum smoothly reticulate, brownish..... | 2. |
| Praescutum reticulately lineolate, black..... | 3. |
| Praescutum rugulose | 13. |
| 2. Wingless and small; mesothorax slightly longer than prothorax. | |
| <i>grandis</i> form <i>minuta</i> Riley. | |
| Winged and large; mesothorax twice as long as prothorax. | |
| <i>grandis</i> form <i>grandis</i> Riley. | |
| 3. Propodeum without distinct, continuous, margined groove; occasionally <i>albomaculata</i> has a margined groove..... | 4 |
| Propodeum with a distinct margined groove..... | 6 |
| 4. Abdomen distinctly shorter than thorax..... <i>agrostidis</i> Howard. | |
| Abdomen longer than thorax..... | 5 |
| 5. Propodeum rugose, generally with a central longitudinal carina; abdominal segments 5 and 6 each distinctly longer than either 3 or 4; species large | <i>websteri</i> Howard. |
| Propodeum usually granulose; abdominal segments 5 and 6 each same length as 3 and 4; species small..... | <i>albomaculata</i> Ashmead. |
| 6. Pronotal spots small to minute..... | 7. |
| Pronotal spots medium to large, occupying about one-half anterior dorsal margin of prothorax..... | 8. |
| 7. Pronotal spots plainly visible from above; first funicle joint plus ring joint only slightly longer than pedicel; abdomen longer than thorax; greatest vertical diameter of the abdomen at third segment.... <i>captiva</i> Howard. | |
| Pronotal spots scarcely visible; first funicle joint plus ring joint distinctly longer than pedicel; greatest vertical diameter of the abdomen often at fifth segment; abdomen shorter than thorax..... | <i>poae</i> , new species. |
| 8. Groove broad, usually wider posteriorly..... | 9. |
| Groove narrow, marginal carinae of groove parallel..... | 10. |
| 9. Rugose within and laterad of the groove; first funicle joint almost twice as long as pedicel; praescutum with numerous broad, shallow impressions..... | <i>dactylicola</i> , new species. |
| Rugose within and usually granulose laterad of the groove; first funicle joint only slightly longer than pedicel; praescutum without (rarely with) broad, shallow impressions..... | <i>albomaculata</i> Ashmead. |

10. Area laterad of groove granulose----- 11.
Area laterad of groove rugose----- 12.
11. Pronotal spots large; species not slender----- *clymi* French.
Pronotal spots very large, almost meeting above; species very slender.
bromicola Howard.
12. Abdominal segment 7 usually shorter than 6; 3 always as long as either of these; first funicle joint longer than pedicel----- *maculata* Howard.
Abdominal segment 7 usually longer than 6; 3 always shorter than 7; first funicle joint same length as pedicel----- *agropyrophila*, new species.
13. Propodeum without distinct continuous median groove----- 14.
Propodeum with distinct continuous median groove----- 15.
14. Legs black, brownish at knees, pronotal spots prominent----- *tritici* Fitch.
Legs reddish-brown, occasionally dusky, pronotal spots inconspicuous.
hordci Harris.
15. Pronotal spots small, occupying about one-half or less of the anterior dorsal margin of prothorax----- 16.
Pronotal spots large, occupying two-thirds or more of the anterior dorsal margin of prothorax----- 19.
16. Legs reddish-brown----- *rufipes*, new species.
Legs black except at knees, and sometimes the front tibiae----- 17.
17. Abdomen long and narrowly lanceolate----- *festucae*, new species.
Abdomen not especially long and narrowly lanceolate----- 18.
18. Propodeal fimbria strong; propodeum rugose; abdominal segment 4 longer than 6----- *vaginicola* Doane.
Propodeal fimbria weak; propodeum often granulose within and laterad of groove; abdominal segments 4 and 6 subequal; tibiae dusky brown----- *secalis* Fitch.
19. All tibiae reddish-brown----- 20.
All tibiae not reddish-brown----- 21.
20. Fifth joint of funicle distinctly longer than broad; first funicle joint distinctly longer than pedicel; abdomen lanceolate----- *hesperus*, new species.
Fifth joint of funicle not distinctly longer than broad; first funicle joint not distinctly longer than pedicel; abdomen lanceolate.
agropyrocola, new species.
Fifth joint of funicle slightly broader than long; fourth quadrate; first funicle joint not distinctly longer than pedicel; abdomen ovate.
ovata, new species.
21. Groove shallow, many times broader than deep anteriorly----- 22.
Groove deep, from 2 to 3 times as deep anteriorly----- 23.
22. Fifth joint of funicle as broad as long; abdomen rather stout; groove shallow and distinctly broader anteriorly----- *clymoxena*, new species.
Fifth joint of funicle distinctly longer than broad; groove broadest anteriorly and abdomen rather stout----- *clymicola*, new species.
Fifth joint of funicle usually longer than broad; fourth as broad as long; groove usually broadest near center; abdomen slender.
atlantica, new species.
23. Abdomen, lateral view, equal in length to head and thorax combined-- 24.
Abdomen, lateral view, longer than head and thorax combined----- 25.
24. Pronotal spots very large, occupying about three-fourths anterior dorsal margin of prothorax; prothorax brownish laterally; fourth and fifth joints of funicle and first 2 club joints quadrate-- *clymophila*, new species.
Pronotal spots medium to large, occupying less than two-thirds anterior dorsal margin of prothorax; prothorax not brownish laterally; funicle and club joints distinctly longer than broad----- *poophila*, new species.

- Pronotal spots large, occupying two-thirds anterior dorsal margin of prothorax; prothorax not brownish; fifth funicle and first two club joints quadrate.....*elymoxena*, new species.
25. Vertical diameter of abdomen at sixth segment only slightly less than its greatest vertical diameter.....*elymivora*, new species.
Vertical diameter of abdomen at sixth segment about one-half its greatest vertical diameter..... 26.
26. Front femora and tibiae reddish-brown.....*elymophthora*, new species.
Front femora and tibiae not reddish-brown..... 27.
27. Middle and hind tibiae fuscous; propodeum convex laterad of groove; abdomen slender.....*occidentalis*, new species.
Middle tibiae fuscous; hind tibiae brownish; not especially convex laterad of groove; abdomen rather stout.....*gillettei*, new species.
Middle and hind tibiae black; propodeum not convex laterad of groove; usually granulose within and laterad of groove.....*elymicola*, new species.

TABLE 2—MALES

1. Praescutum reticulately lineolate..... 2.
Praescutum rugulose..... 9.
2. Pronotal spots minute, not visible from above..... 3.
Pronotal spots small but visible from above..... 4.
Pronotal spots large, occupying one-third to one-half anterior dorsal margin of prothorax..... 6.
3. Propodeum without groove; thorax very smooth, almost polished; scape in lateral profile distinctly longer than broad and broadest near the base.
grandis form *minuta* Riley.
Propodeum with complete groove, thorax not particularly smooth and not polished; scape in lateral profile almost as broad as long.....*poae*, new species.
4. Praescutum with numerous broad and very shallow impressions; pronotal spots scarcely visible from above; scape in lateral profile broadest at center; third flagellar joint about twice as long as broad.....*captiva* Howard.
Praescutum without impressions, pronotal spots clearly visible from above; scape in lateral profile broadest near base; third flagellar joint about 4 times as long as broad..... 5.
5. Three to four annulations at the distal extremity of the penultimate segment of flagellum; petiole and hind coxae of equal length.
agropyrophila, new species.
One annulation at the distal extremity of the penultimate segment of the flagellum; petiole shorter than hind coxae.....*maculata* Howard.
6. Flagellum and pedicel together longer than head, thorax, and petiole combined.....*albomaculata* Ashmead.
Flagellum and pedicel together shorter than head, thorax, and petiole combined..... 7.
7. Propodeal groove incomplete; spur on end of apical joint of antennae conspicuous, about 4 times as long as broad.....*websteri* Howard.
Propodeal groove complete..... 8.
8. Spur on end of apical joint of antennae inconspicuous, about twice as long as broad; tibiae black; species robust.....*dactylicola*, new species.
Spur on end of apical joint of antennae long and slender, about 4 times as long as broad; tibiae brownish-black; species very slender.
bromicola Howard.
9. Without propodeal groove..... 10.
With propodeal groove..... 13.

10. Petiole three-fourths to about equal the length of hind coxae-----11.
Petiole one-half the length of hind coxae-----12.
11. Propodeum rugose; pronotal spots not visible from above-----*tritici* Fitch.
Propodeum granulose; pronotal spots visible from above.
atlantica, new species.
12. Pronotal spots not visible from above; all tibiae reddish-brown.
hordei Harris.
Pronotal spots visible from above; tibiae dusky-----*secalis* Fitch.
13. Tibiae reddish-brown-----14.
Middle and hind tibiae brownish to black-----15.
14. All femora reddish-brown-----*rufipes*, new species
Basal one-half to two-thirds of hind and basal one-third of middle femora
blackish-----*hesperus*, new species.
15. Pronotal spots minute, scarcely visible from above-----16.
Pronotal spots occupying less than one-half anterior dorsal margin of
prothorax-----17.
Pronotal spots occupying two-thirds anterior dorsal margin of prothorax-----21.
16. Scape, as seen laterally in profile, approximately same width throughout
and about 8 times as long as broad, no shoulder distally.
festucae, new species.
Scape, as seen laterally in profile, approximately same width throughout,
and about 4 times as long as broad and with a slight shoulder dis-
tally-----*tritici* Fitch.
17. Scape, as seen laterally in profile, approximately same width throughout;
shoulder low-----18.
Scape, as seen laterally in profile, much broader near distal extremity;
shoulder high and very prominent-----19.
18. Flagellum longer than head and thorax combined-----*orata*, new species.
Flagellum equal to or shorter than head and thorax combined.
poophila, new species.
19. Pronotal spots usually bright; flagellum equal to or longer than head and
thorax combined-----20.
Pronotal spots dull and obscure; flagellum shorter than head and thorax
combined-----*elymoxena*, new species.
20. Groove deep; propodeum rugose; pronotal spots usually occupying one-half
anterior dorsal margin of prothorax; bristles on first flagellar joint
only slightly longer than its diameter; bristles very numerous.
elymirora, new species.
Groove shallow; propodeum granulose; pronodal spots usually occupying
one-third anterior dorsal margin of prothorax; bristles on first flagellar
joint about twice the length of its diameter; bristles somewhat sparse.
occidentalis, new species.
21. Pronotal spots bright-----*elymnicola*, new species.
Pronotal spots usually dull-----*elymophthora*, new species.
Pronotal spots dull, often giving anterior margin of prothorax a brownish
tint-----*elymophila*, new species.

ILLUSTRATIONS.

It seemed unnecessary to the writers to have drawings made of the entire insect as in the majority of cases no specific difference can be illustrated in this manner. Drawings were made of the propodea, ovipositors or saws, and the antennae. In other words only those parts were drawn which most clearly showed specific characters. While the shape of the abdomen is specific in many instances it

shrinks greatly in different directions upon the death of the insect, and it was therefore thought unnecessary to illustrate it.

DESCRIPTIONS OF SPECIES.

HARMOLITA GRANDIS form *GRANDIS* Riley.

Plate 39, fig. 4; plate 45, fig. 20.

Isosoma grande RILEY, Bull. Brooklyn Ent. Soc., vol. 7, p. 111, 1884.

Isosoma (*Philachyra*) *grande* (Riley) HOWARD, U. S. Dept. Agr., Div. Ent., Bull. tech. ser. No. 2, p. 9, 1896.

This was originally described by Riley as follows:

Female.—Length of body, 4.2 mm.; expanse, 7.6 mm.; antennae rather more slender and less clavate than in the spring form and but half the length of the thorax. Thorax with the mesonotum slightly more rugulose; wings larger and less hyaline than in the winged specimens of the spring form, with the veins extending to the outer third, the submarginal nearly 4 times as long as the marginal; legs with the femora less swollen. Abdomen not so long as the thorax, stouter than in the spring form, ovate-acuminate, approaching typical *Eurytoma*. Less hairy than in the spring form, especially about the legs, the hairs about the abdomen being less numerous, less regular, and shorter. Coloration similar to that of spring form, but brighter and more highly contrasting, the pronotal spots larger and brighter yellow, the pedicel of the antennae yellow, and the femora with a definitely limited suboval yellowish spot below, near the tip, extending two-fifths the length of the femur on front pair, smaller on the middle pair, and still shorter and less definite on posterior pair.

Supplementary to Riley's description:

Abdomen from base of second segment shorter than head and thorax combined. First joint of club longer than broad. Pedicel plus ring-joint shorter than first funicle joint. Mesothorax twice as long as prothorax, and broader at scutum. Area laterad of propodial groove black.

Males.—Unknown.

The supplementary description of *H. grandis* is based on numerous specimens reared in cages under artificial conditions and from specimens reared from wheat straw collected in several States, from California to the Atlantic and from Canada to Mexico.

This species inhabits the center of the stem and has been reared only from wheat; it is usually found wherever wheat is grown.

Winged females of *H. grandis* form *minuta*, and occasionally wingless females of *grandis* will be found. Both forms are normally thelytokous, though males of form *minuta* are occasionally met with.

HARMOLITA GRANDIS form *MINUTA* Riley.

Plate 39, fig. 5; plate 45, fig. 15; plate 48, fig. 1.

Isosoma tritici RILEY, Amer. Nat., March, p. 247, 1882 (not *tritici* Fitch).

Riley's original description was as follows:

Female.—Length of body, 2.8 mm.; expanse of wings, 4 mm.; greatest width of front wing, 0.7 mm.; antennae, subclavate, $\frac{3}{4}$ length of thorax; whole body

(with exception of metanotum, which is finely punctulate) highly polished and sparsely covered with long hairs toward the end of the abdomen; abdomen longer than thorax and stouter. Color, pitchy black; scape of antennae, occasionally a small patch of cheek, mesoscutum, femoro-tibial articulations, coxae above and tarsi (except last joint) tawny; pronotal spots large, oval, and pale yellowish in color; wing veins dusky yellow and extending to beyond middle of wing; submarginal three times as long as marginal; postmarginal very slightly shorter than marginal, and stigmal also shorter than marginal.

Supplementary to Riley's description:

Abdomen from base of second segment longer than head and thorax combined. First joint of club broader than long. Pedicel plus ring-joint equal in length to first funicle joint. Mesothorax slightly longer than prothorax and narrower at scutum. Area laterad of propodeal groove brownish.

Male (pl. 48, fig. 1).—Praescutum shining black, polished, with very slight reticulations. Pronotal spots small, scarcely visible from above, and are obscure.

Propodeum convex, without a groove, and coarsely granulose.

Petiole about one and one-half times as long as broad, about two-thirds length of hind coxae. Second abdominal segment bears four hairs or bristles, 2 on each side, other segments also bear conspicuous bristles or hairs.

Legs black except at knees, which are testaceous.

Antennae: Flagellum with pedicel, equal to head and thorax combined. Hairs on first joint of flagellum equal in length to the last joint of the antennae. Tubercle on last joint of antennae only about twice as long as broad. Scape, exclusive of base, one-third as broad as long in lateral profile; is broadest in basal half; no distinct shoulder in distal extremity. Only one annulation at flagellum articulations except at distal extremity of second joints where there are two.

Male.—Heretofore undescribed.

HARMOLITA AGROSTIDIS Howard.

Plate 43, fig. 1; plate 45, fig. 7.

Isosoma agrostidis HOWARD, U. S. Dept. Agr., Div. Ent., Bull. tech. ser. No. 2, p. 12, 1896.

The original description by Howard was as follows:

Female.—Length, 2.8 mm.; expanse, 5.2 mm. Head and mesothorax finely shagreened and also very sparsely and finely rugulose; metanotum somewhat coarsely rugulose and without median furrow, but with a rather faint median, longitudinal carina; mesoscutellum rather rounded at apex, not sharply pointed; axillae and parapsidal sutures nearly meeting, pronotal spots evident but small; scarcely seen from above; first funicle joint of antennae not quite as long as second; remaining joints subequal, somewhat rounded; club joints very distinct, terminal one acuminate and styliferous. Abdomen short and stout, considerably shorter than thorax; subglobose in shape, its second segment occupy-

ing nearly half of the whole surface; segments 3 to 7 short, subequal. Entire body very free from pilosity except metanotal fimbria, which is pronounced and white, and except hind coxae which have slight whitish pilosity on the outer side. The claw of stigma club straight, issuing from the tip of club and extending considerably beyond it, club itself abruptly truncate, triangular. Entire body including legs, black except pronotal spots, femoro-tibial knees and tarsi, which are a dark honey yellow.

Supplementary to Howard's description:

Female.—Rather roughly reticulately lineolate on praescutum. Pronotal spots small but clearly visible from above. Propodeum without a distinct, continuous, margined, median, longitudinal groove; there is a faint central longitudinal carina, and often there is a more or less nearly parallel carina on either side; there is a granulose area laterad of center in the posterior portion. Abdominal segments 3 to 9 gradually decreasing in length. 7 equal to 6.

Femora black, knees testaceous, tibiae brownish-black. Fifth flagellar joint as broad as long.

The supplementary description for *H. agrostidis* is based upon the type in the United States National Museum, Washington.

Males.—Unknown.

HARMOLITA WEBSTERI Howard.

Plate 39, fig. 2; plate 43, fig. 2; plate 46, fig. 9; plate 48, fig. 6.

Eurytoma hordci FITCH (not Harris) Seventh Rept. Ins. N. Y. (Author's Edition), p. 154, 1862.

Isosoma websteri HOWARD, U. S. Dept. Agr., Div. Ent., Bull. tech. ser. No. 2, p. 15, 1896.

Isosoma hirtifrons HOWARD, U. S. Dept. Agr., Div. Ent., Bull. tech. ser. No. 2, p. 16, 1896.

Isoma fitchi HOWARD, U. S. Dept. Agr., Div. Ent., Bull. tech. ser. No. 2, p. 20, 1896.

Female.—Praescutum reticulately lineolate and without any broad shallow impressions. Pronotal spots medium, occupying scarcely one-half anterior dorsal margin of prothorax.

Propodeum without a distinct continuous margined groove, although there is a beginning of a groove anteriorly, the prominent margined carinae curving around to the spiracles. There is usually a distinct, continuous central longitudinal carina, and occasionally there is a slight depression in the center of the propodeum for its entire length. Propodeum rugose; fimbria prominent.

Abdomen equal to or slightly longer than head and thorax combined; segment 2 about equals 3 and 4 combined; 3 and 4 subequal; 5 and 6 subequal and each longer than 3 or 4.

Legs black, except at knees, which are testaceous.

Antennae: First funicle plus ring-joint one and one-half times as long as pedicel; none of funicular joints quadrate; club joints not quadrate and about same width as funicle joints. Scape black. Species large.

Male (pl. 48, fig. 6).—Praescutum same as in female; pronotal spots large, occupying about one-half anterior dorsal margin of prothorax and bright in color.

Propodeal groove incomplete and propodeum rugose.

Petiole about two-thirds length of hind coxae and about one and one-half times as long as broad.

Legs black, except knees, which are testaceous.

Antennae: Flagellum and pedicel together shorter than head, thorax and petiole combined; hairs on first joint about same length as apical joint of antennae; prominent spur at tip of apical joint which is about four times as long as broad. Scape broadest near center, about twice as broad as first flagellar joint and one-third as broad as long, exclusive of last. Three to five annulations at the articulation of all flagellar joints except at distal extremity of the first and second when there is one.

Redescribed from many specimens from cage rearings, from specimens reared from rye collected in Indiana, Ohio, and Pennsylvania, and from the type in the United States National Museum. It is also known to occur in California and Illinois.

This species inhabits the center of the stem and breeds only in rye. It is normally thelytokous, males very rarely occurring.

HARMOLITA ALBOMACULATA Ashmead.

Plate 40, fig. 8; plate 43, figs. 3, 4; plate 45, fig. 17; plate 48, fig. 5.

Isosoma albomaculatum ASHMEAD, Trans. Amer. Ent. Soc., vol. 21, p. 329. 1894.

Female.—Praescutum reticulately lineolate and without broad impressions, except occasionally a few small shallow ones. Pronotal spots large, occupying one-half to two-thirds anterior dorsal margin of prothorax.

Propodeum with or without groove. If groove is present there are prominent rugae within and it may be either rugose or granulose laterad of groove. Spiracular carinae prominent. If groove is not continuous there is a beginning anteriorly and the prominent carinae curve around to the spiracles. Propodeum may be granulose or rugose and may be slightly depressed down center; there is often a median carina. Fimbria rather prominent.

Abdomen equal to or shorter than head and thorax combined and rather stout. Segment 2 about equals 3 and 4 combined; 3, 4, 5, and 6 subequal; 3 usually shortest and 7 longest.

Legs black except at knees which are testaceous.

Antennae: First funicle joint plus ring-joint plainly longer than pedicel; all the funicle joints distinctly longer than broad; club joints slightly longer than broad and distinctly broader than funicle. Scape black. Species ranges from very small to medium.

Male (pl. 48, fig. 5).—Praescutum same as in female. Pronotal spots large, bright, occupying about one-half anterior dorsal margin of the prothorax.

Propodeal groove usually incomplete, occasionally complete; usually granulose within and laterad of groove.

Legs: Black except at knees and distal one-third of front femora; knees and distal one-third of front femora testaceous.

Antennae: Flagellum and pedicel longer than head, thorax, and petiole combined. Hair on first joint of flagellum distinctly longer than last joint of antennae. Spur on distal joint of flagellum scarcely twice as long as broad. Scape broadest near base and twice as broad as first flagellar joint. Four or more annulations at all articulations of flagellum. Scape scarcely three times as long as broad, exclusive of base.

Redescribed from specimens reared in cages under artificial conditions, and from specimens reared from stems of timothy collected in the Dakotas, Nebraska, Kansas, and from many States east of the Mississippi River, including New England; and from the types in the United States National Museum in Washington.

It inhabits the center of the stem and breeds only in timothy (*Phleum pratense*). It probably occurs wherever timothy is grown, except possibly in the irrigated districts of the West. Males normally occur.

HARMOLITA CAPTIVA Howard.

Plate 39, fig. 9; plate 43, fig. 5; plate 45, fig. 11; plate 47, fig. 6.

Isosoma captivum HOWARD, U. S. Dept. Agr., Div. Ent., Bull. tech. ser. No. 2, p. 13, 1896.

Female.—Praescutum roughly reticulately lineolate and bearing numerous broad, very shallow, impressions. Pronotal spots small but very distinctly visible from above.

Propodeum with very narrow, deep, continuous, median, longitudinal groove, which contains numerous cross rugae that are quite regularly spaced; rugose laterad of groove; spiracular carinae prominent; fimbria not prominent.

Abdomen longer than thorax. Segment 2 about one-third as long as abdomen exclusive of segment 1; greatest vertical diameter of the abdomen is at the third segment.

Legs: Femora black except at distal extremities which are testaceous; the front tibia and the extremities of the other tibia are testaceous; other parts of the tibia are fuscous.

Antennae: First funicle plus ring-joint usually only slightly longer than pedicel; none of the funicle or club joints quadrate and all of the flagellar joints the same width; scape about the same length as the first funicle joint and pedicel combined; scape black.

Species medium in size.

Male (pl. 47, fig. 6).—Praescutum same as in female and bears numerous broad and very shallow impressions. Pronotal spots minute but visible from above.

Propodeal groove complete with numerous cross rugae; rugose laterad of groove.

Petiole broader than coxae and one and one-half times as long as broad.

Legs black except at knees which are testaceous; front tibiae fuscous.

Antennae: Flagellum and pedicel shorter than head and thorax combined; hairs on first joint of flagellum shorter than apical joint of antennae; scape distinctly broadest at center and nearly three times as long as broad exclusive of base; 1 or 2 annulations at each articulation of the flagellum; prominent spur at end of apical joint of antennae. Scape slightly broader than first flagellar joint.

Redescribed from five females and two males reared from galls in the stems of blue grass collected at Richmond, Indiana, by the senior writer and from the types in the United States National Museum. It is also recorded from Norman, Illinois, and La Fayette, Indiana, by Dr. L. O. Howard and Prof. F. M. Webster.

This species makes inconspicuous galls near the base of the seed stalks of blue grass and has been reared only from this grass (*Poa pratensis*). Males normally occur.

HARMOLITA POAE, new species.

Plate 39, fig. 10; plate 43, fig. 6; plate 45, fig. 18; plate 47, fig. 1.

Female.—Length 2.5 mm. Praescutum reticulately lineolate with occasional small, very shallow impressions. Pronotal spots very small, scarcely visible from above.

Propodeum with a narrow, deep, continuous, margined, median, longitudinal groove, which has numerous cross rugae; slightly rugose or occasionally granulose laterad of groove. The groove is sometimes shallow and not always well defined; there are sometimes several longitudinal carinae within the groove; spiracular carinae usually prominent; fimbria not prominent.

Abdomen usually distinctly shorter than thorax; segment 2 one-third to one-half as long as the entire abdomen (dorsally) exclusive of segment 1. The greatest vertical diameter of abdomen is sometimes at fifth segment; abdominal segments vary greatly in length.

Legs black except at knees and anterior face of front femora which are testaceous.

Antennae: First funicle plus ring-joint almost twice as long as pedicel; none of funicle or club joints quadrate; flagellar joints about the same width throughout; the club joints are sometimes slightly narrower than the other joints; scape shorter than first funicle joint and pedicel combined; scape black.

Species medium in size.

Male (pl. 47, fig. 1).—Length 2 mm. Praescutum same as in female. Pronotal spots minute, not visible from above.

Propodeal groove may be complete or incomplete; propodeum either granulose or rugose.

Petiole about one and one-half times as long as broad.

Legs black except at knees, which are testaceous; front tibiae are fuscous.

Antennae: Flagellum and pedicel shorter than head and thorax combined; hairs on first joint or flagellum as long as the last joint of antennae; end of apical joint of antennae has a conspicuous broad and long spur; scape is distinctly broadest near the distal extremity and is one-half as broad as long exclusive of base; 2 to 4 annulations at the articulation of all flagellar joints except at the distal extremity of the penultimate where there are none. Scape nearly twice as broad as first flagellar joint.

Type-locality.—La Fayette, Indiana.

Type.—Cat. No. 21755, U. S. N. M.

Described from many females and males reared in cages under artificial conditions and from specimens reared from stems of blue grass collected at Richmond and La Fayette, Indiana, by the senior writer.

This species inhabits the center of the stem and has been reared only from the seed stalks of blue grass (*Poa pratensis*). It probably occurs wherever blue grass grows normally. Males normally occur.

HARMOLITA DACTYLICOLA, new species.

Plate 40, fig. 7; plate 43, fig. 7; plate 45, fig. 16; plate 48, fig. 4.

Female.—Length 3.0 mm. Praescutum reticulately lineolate with numerous broad, irregular, shallow impressions, rarely without them. Pronotal spots large, occupying one-half to two-thirds anterior dorsal margin of prothorax.

Propodeum with a distinct, continuous, medium, longitudinal, margined groove, which is slightly broader posteriorly and contains numerous strong cross rugae; there is often an indication of a central carina; area laterad of groove usually rugose though sometimes granulose; spiracular carinae usually prominent; fimbria rather prominent.

Abdomen usually longer than head and thorax combined; segment 2 usually longer than 3 and 4 combined; 3, 4, 5, and 6 subequal, though 3 usually shortest and 7 usually longest; abdomen quite pointed as seen laterally.

Legs black except at knees which are testaceous.

Antennae: First joint of funicle plus ring-joint usually nearly twice as long as pedicel; all of funicle and club joints distinctly longer than broad; club joints same width as funicle. Scape black.

Species medium in size.

Male (pl. 48, fig. 4).—Length 2.0 mm. Praescutum as in female. Pronotal spots large, bright, occupying one-third to one-half anterior dorsal margin of prothorax.

Propodeum with a complete groove; rugose within and laterad of groove.

Petiole about twice as long as broad, is three-fourths length of hind coxae.

Legs black except distal one-third of front femora and knees which are testaceous.

Antennae: Flagellum with pedicel equal to head and thorax combined; hairs on the first joint of flagellum distinctly longer than the last joint of antennae; last joint bears a short tubercle which is about twice as long as broad. Scape exclusive of base, one-third as broad as long as seen in lateral profile; is broader in basal half than in distal; no distinct shoulder in distal extremity; distinctly broader than first joint of flagellum. There may be from one to three annulations or indications of such at each articulation of the flagellum.

Type-locality.—Front Royal, Virginia.

Type.—Cat. No. 21756, U.S.N.M.

Described from many females and males reared in cages under artificial conditions and from specimens reared from orchard grass (*Dactylis glomerata*) collected in Indiana, Ohio, New York, Michigan, Pennsylvania, and Virginia.

This species inhabits the center of the stem and breeds only in orchard grass. Males normally occur.

HARMOLITA ELYMI French.

Plate 39, fig. 3; plate 43, fig. 8; plate 45, fig. 21.

Isosoma elymi FRENCH. Can. Ent., vol. 14, p. 9, 1882.

Isosoma elymi (French) HOWARD, U. S. Dept. Agr., Div. Ent., Bull. tech. ser. No. 2, p. 14, 1896.

Female.—Praescutum reticulately lineolate and occasionally with a few small shallow impressions. Pronotal spots large, occupying one-half to two-thirds anterior dorsal margin of prothorax.

Propodeum with a distinct, narrow, continuous, median, longitudinal, margined groove, which contains numerous cross rugae; marginal carinae usually parallel and regular; the spiracular carinae prominent. There is a shield-shaped granulose area (rarely rugose) laterad of groove; fimbria not prominent.

Abdomen equal to or shorter than head and thorax combined; segment 2 almost equal to 3, 4, and 5 combined, occupying nearly one-third of the entire dorsal surface; 3, 4, and 6 subequal.

Legs black except at knees which are testaceous.

Antennae: First funicle plus ring-joint one and one-half times as long as pedicel; none of the funicle joints quadrate; club joints not quadrate and about the same width as funicle joints. Scape black.

Species ranges from small to medium in size.

Males.—Unknown.

Redescribed from many females reared in cages under artificial conditions and from specimens reared from stems of species of *Elymus* from practically all over the United States, and from the type in the United States National Museum.

This species inhabits the center of the stem and breeds only in spurs of *Elymus*. It probably occurs wherever *Elymus* normally grows. It is normally thelytokous, males never having been observed.

HARMOLITA BROMICOLA Howard.

Plate 40, fig. 6; plate 43, fig. 9; plate 45, fig. 6.

Isosoma bromicola HOWARD, U. S. Dept. Agr., Div. Ent., Bull. tech. ser. No. 2, p. 18, 1896.

Howard's original description is as follows:

Female.—Length 3.1 mm.; expanse, 4.6 mm. Punctuation of head, pronotum, and mesonotum (praescutum) like that of *H. maculata*, which it also resembles in the large pronotal spots. Metanotum (propodeum) with a distinct, strongly emarginate, central, longitudinal groove, the space either side finely granulate, with occasional irregular carinae. Abdomen longer than thorax; segment 2 as long as 3, 4, and 5 together; 5 and 6 subequal. Antennae rather long and straight; pilose; joint 1 of funicle only slightly longer than joint 2; club not quite as long as three preceding joints together, strongly flattened from side. Face very slightly pilose; metanotal (propodeal) fimbria sparse. The whole insect is smaller, slenderer, and more delicate in appearance than any except *grandis* form *minuta*.

Male.—Length, 1.9 mm.; expanse, 3.4 mm. Petiole short, not as long as first abdominal segment and scarcely as long as hind coxae; scape of antennae slightly widened; funicle joints very slightly rounded above and very slightly pedicellate; each more than twice as long as pedicel and each faintly constricted in middle; club divided into two pedicellate joints as with *H. captiva*. All legs black with light yellow knees.

Supplementary to Howard's description:

Female.—Praescutum reticulately lineolate, very smooth, almost as smooth as *H. grandis*. Pronotal spots very large, sometimes almost meeting on the anterior margin of the prothorax. Propodeum with a continuous narrow, shallow, margined, central, longitudinal groove; marginal carinae parallel and regular. There is a large semicircular granulose area laterad of groove. Abdomen about equal to head and thorax combined and is very slender lanceolate; segments irregular in length; 2 may equal 3, 4, and 5 combined or may only equal 3 and 4; segments 3 to 7 may gradually increase in length or they may be approximately the same length. Fimbria not prominent.

Legs: Femora black, knees testaceous, and tibia brownish-black.

Male.—Praescutum same as in female. Pronotal spots large, occupying one-half anterior dorsal margin of the prothorax. Propodeum with narrow, shallow, margined, median, longitudinal groove; slightly rugose laterad of groove. Abdomen very slender, sides almost parallel. Legs colored as in female. Antennae: Flagellum about as long as head and thorax combined.

This supplementary description is based on the types in the United State National Museum. Males normally occur.

HARMOLITA MACULATA Howard.

Plate 39, fig. 8; plate 42, fig. 2; plate 43, fig. 10; plate 45, fig. 14; plate 47, fig. 7.

Isosoma maculatum HOWARD. U. S. Dept. Agr., Div. Ent., Bull. tech. ser. No. 2, p. 15, 1896.

Female.—Praescutum reticulately lineolate and without (rarely with a few) any broad shallow impressions. Pronotal spots large, occupying one-half to two-thirds anterior dorsal margin of the prothorax.

Propodeum with a distinct narrow continuous, median, longitudinal, margined groove, which has numerous cross rugae and usually an indication of a central carina; spiracular carinae not inconspicuous though they are not usually prominent; area laterad of groove rugose, rarely granulose; fimbria not prominent.

Abdomen shorter than head and thorax combined; segment 2 longer than 3 and 4 combined; 7 usually shorter than 6; 3 usually as long as either.

Legs black except at knees which are testaceous.

Antennae: First joint of funicle plus ring-joint much longer than pedicel; neither club nor funicle joints quadrate; club slightly broader than funicle; scape black.

Species ranges from minute to medium in size.

Male (pl. 47, fig. 7).—Praescutum as in female. Pronotal spots small but visible from above, occupying less than one-half of the anterior dorsal margin of the prothorax.

Propodeal groove usually complete; propodeum rugose laterad of and within the groove; often there is no complete groove and the propodeum is often granulose.

Legs black except at knees which are testaceous.

Antennae: Flagellum and pedicel shorter than head, thorax, and petiole combined; hairs on the first joint of flagellum same length as the last joint of antennae. The last joint of the antennae ends in a long conical spur, about four times as long as broad; scape broadest near the center and distinctly broader than first flagellar joint; two to four annulations at the articulation of all flagellar joints except the

distal extremity of the penultimate joint which has only one. Scape scarcely three times as long as broad, exclusive of base.

Redescribed from females and males reared in cages under artificial conditions, and from specimens reared from stems of species of *Bromus* collected from many of the States east of the Mississippi River, and from the type in the United States National Museum. The males heretofore never have been described.

This species inhabits the center of the stem and breeds only in cheat (*Bromus secalinus*) and other species of *Bromus*. It probably occurs wherever *Bromus* grows, which is pretty much all over the United States. It has proven to be arrhenotokous under control conditions though in nature both sexes regularly occur.

HARMOLITA AGROPYROPHILA, new species.

Plate 39, fig. 7; plate 43, fig. 11; plate 45, fig. 19; plate 47, fig. 8.

Female.—Length 2.5 mm. Praescutum reticulately lineolate and usually without broad shallow impressions. Pronotal spots large, occupying from one-half to two-thirds anterior margin of the prothorax.

Propodeum with a distinct, narrow, continuous, median, margined, longitudinal groove, which contains numerous cross rugae; spiracular carinae often weak and not prominent and spiracular area often not well defined; area laterad of groove rugose and occasionally granulose; fimbria not prominent.

Abdomen shorter than head and thorax combined; segment 2, sometimes as long as 3, 4, and 5 combined and occupies about one-third the length of the entire dorsal surface; 7 usually longer than 6; 3 always shorter than 7.

Legs black except at knees which are testaceous.

Antennae: First funicle joint plus ring-joint usually only slightly longer than pedicel; neither club nor funicle joints quadrate; club joints broader than funicle. Scape black.

Species ranges from minute to medium in size.

Male (pl. 47, fig. 8).—Length 2 mm. Praescutum as in female. Pronotal spots small but visible from above, occupying less than one-half the anterior dorsal margin of the prothorax and are bright.

Propodeum either rugose or granulose, with or without a continuous groove.

Petiole nearly twice as long as broad.

Legs black except at knees which are testaceous.

Antennae: Flagellum and pedicel shorter than head, thorax and petiole combined; halves on first joint of flagellum same length as the last joint of antennae. Last joint ends in a rather conspicuous spur, which may vary from 2 to 4 times as long as broad; scape distinctly broadest near base and much broader than the first flagellar

joint; there are from 3 to 5 annulations at the articulation of the joints of the flagellum. Scape, exclusive of base, scarcely three times as long as broad.

Type-locality.—Charlottesville, Virginia.

Type.—Cat. No. 21757, U.S.N.M.

Described from many females and males reared in cages under artificial conditions and from specimens reared from stems of species of *Agropyron* collected in eastern Kansas, Indiana, Ohio, Michigan, New York, and Pennsylvania.

This species inhabits the center of the stem and breeds only in species of *Agropyron*. Males normally occur.

HARMOLITA TRITICI Fitch.

Plate 41, fig. 4; plate 42, fig. 1; plate 44, fig. 1; plate 45, fig. 12; plate 47, fig. 4.

Eurytoma tritici FITCH, Journ. N. Y. State Agr. Soc., vol. 10, p. 115, 1859.

Isosoma nigrum COOK, Rural New Yorker, p. 314, June, 1885.

Isosoma tritici (Fitch) HOWARD, U. S. Dept. Agr., Div. Ent. Bull. tech. ser. No. 2, p. 17, 1896.

Female.—Praescutum rugulose. Pronotal spots minute to small, visible from above, occupying scarcely one-fourth anterior dorsal margin of prothorax.

Propodeum without a continuous, median, longitudinal groove, although there is a trace of a groove in the anterior one-third the margined carinae of which curve around the spiracles. There is also a well-defined central carina the full length of this groove. Prododeum very rugose, the rugae extending in a more or less longitudinal direction; fimbria not prominent.

Abdomen longer than head and thorax combined; segment 2 about one-fifth the length of the abdomen (dorsally) exclusive of first segment; 3 shortest, 5 longest; 4 and 6 subequal and each longer than 7.

Legs: Knees and front tibiae are testaceous; basal half of front femora, middle and hind femora and tibiae black, although the middle and hind tibiae are occasionally somewhat fuscous.

Antennae: First funicle plus ring-joint the same length or only slightly longer than pedicel; none of funicle or club joints quadrate; club joints same width as funicle; scape black.

Species large in size.

Male (pl. 47, fig. 4).—Praescutum same as in female. Pronotal spots not visible from above when head is in normal position.

Propodeum with or without a groove; when present, the groove is broad and shallow; propodeum rugose.

Petiole two-thirds length of second abdominal segment and three-fourths to about equal to the hind coxae; rugose to granulose.

Legs black except at knees and front tibia, which are brown to dusky.

Antennae: Flagellum with pedicel shorter than head and thorax combined. Scape as seen in lateral profile about the same width throughout and is broader than the first flagellar joint; near distal extremity there is a distinct shoulder; four times as long as broad exclusive of base.

Redescribed from many females and males reared in cages under artificial conditions and from specimens reared from wheat stubble collected in the field in the States of Missouri, Illinois, Indiana, Ohio, Michigan, New York, Pennsylvania, Maryland, Kentucky, Tennessee, Virginia, and West Virginia, and from the types in the United States National Museum.

This species makes conspicuous hardened enlargements or galls in wheat stems, usually about the second or third internode from the base of the plant, though they may occur at every internode. It breeds only in wheat and has proven to be arrhenotokous under control conditions, though both sexes regularly occur in nature.

HARMOLITA HORDEI Harris.

Plate 41, fig. 5; plate 44, fig. 6; plate 46, fig. 8; plate 48, fig. 7.

Ichneumon hordei HARRIS, New England Farmer, vol. 9, p. 2, July 23, 1830.

Eurytoma fulvipes FITCH, 7th Rept. Ins. N. Y. (sep. ed.), p. 154, 1862.

Eurytoma flavipes FITCH, 7th Rept. Ins. N. Y., p. 159, 162, 1862.

Isosoma hordei WALSH, Amer. Ent., vol. 2, p. 330, Oct., 1870.

Isosoma hordei (Harris) HOWARD, U. S. Dept. Agr., Div. Ent. Bull. tech. ser. No. 2, p. 18, 1896.

Female.—Praescutum rugulose. Pronotal spots minute, not visible from above; frequently there is only a trace.

Propodeum without a distinct groove, though there is frequently a slight depression down the center and there is often a median longitudinal carina.

Abdomen is distinctly longer than head and thorax combined; segment 2 a little over one-fifth the length of the abdomen, exclusive of one; 3 the shortest, 5 longest; 4, 6, and 7 subequal.

Legs a translucent reddish-brown, though occasionally specimens may have all the legs dusky, the tibiae being testaceous.

Antennae: First funicle plus ring-joint only slightly longer than pedicel; all joints longer than broad; club slightly broader than funicle; scape brownish, flagellum black.

Species medium to large in size.

Male (pl. 48, fig. 7).—Praescutum as in female. Pronotal spots minute, not visible from above.

Propodeum rugose, without a groove.

Petiole about one-half the length of hind coxae; rugose to granulose.

Legs: Tibiae and tarsi reddish-brown; front and middle femora vary from black in basal half to reddish-brown, being always reddish-brown in distal half; hind femora black to dusky except at knees, which are light brown.

Antennae: Flagellum with pedicel shorter than head and thorax combined; scape as seen in lateral profile about same width throughout and is about equal in width to first flagellar joint; shoulder near distal extremity of scape not conspicuous; nearly 5 times as long as broad, exclusive of base. Scape brownish.

Redescribed from many females reared in cages under artificial conditions, from specimens reared from barley stubble collected at Auburn and Little Falls, New York, by the senior writer, from Harris's type in Boston Society of Natural History and from Fitch's *Eurytoma fulvipes* in the collection of the United States National Museum.

This species is a gall former, making conspicuous hardened enlargements above the second to fourth nodes in barley straw. It breeds only in barley, and is normally thelytokous, males rarely occurring.

Walsh reared a number of specimens from barley straw sent to him from Canada¹ and stated that he found Fitch's *tritici* and *secalis* and Harris's *hordei* among them, basing his identification upon the coloration of the legs. He therefore considered *tritici* Fitch and *secalis* Fitch to be synonyms of *hordei* Harris. He undoubtedly had *H. hordei* Harris before him at the time.

HARMOLITA RUFIPES, new species.

Plate 40, fig. 1; plate 44, fig. 2; plate 46, figs. 7, 11.

Female.—Length 4 mm. Praescutum rugulose. Pronotal spots small, occupying one-half or less of the anterior dorsal margin of prothorax.

Propodeum with a continuous, narrow, deep, margined, median, longitudinal groove with numerous cross rugae; marginal carinae of groove irregular, often interrupted.

Abdomen usually distinctly longer than head and thorax combined; segment 3 shortest, 5 longest; 4 and 7 subequal; 6 frequently longer than either; segment 2 from one-sixth to one-fourth the length of the abdomen (dorsally) exclusive of 1.

Legs a translucent to opaque reddish-brown.

Antennae: First funicle plus ring-joint longer than pedicel; none of funicle or club joints are quadrate; club about same width as the three preceding joints. Scape black.

Species large to very large in size.

Male (pl. 46, fig. 7).—Length 3.0 mm. Praescutum as in female. Pronotal spots small, occupying less than one-half anterior dorsal margin of prothorax.

¹ Amer. Ent., vol. 2, p. 330, October, 1870.

Propodeum with a complete, deep, narrow groove; propodeum rugose.

Petiole about the same length as hind coxae.

Legs a translucent to opaque reddish-brown.

Antennae: Flagellum with pedicel equal to head and thorax combined; scape as seen in lateral profile broadest distally; three times as long as broad exclusive of base; at broadest place about twice as broad as first flagellar joint; near distal extremity there is a distinct shoulder.

Type-locality.—Champaign, Illinois.

Type.—Cat. No. 21758, U.S.N.M.

Described from many females and males reared from stems of species of *Elymus* collected by the late Prof. F. M. Webster in Illinois; in Kansas and Nebraska by Mr. G. I. Reeves; in Utah by Mr. T. H. Parks; and in New Mexico by Mr. C. N. Ainslie.

H. rufipes makes or forms inconspicuous galls in the internode just below the head. There is often no external enlargement of the stem where the galls occur. It has been reared only from species of *Elymus*. Males normally occur.

HARMOLITA FESTUCAE, new species.

Plate 41, fig. 10; plate 43, fig. 14; plate 45, fig. 10; plate 46, fig. 12.

Females.—Length 3.5 mm. Praescutum densely rugulose. Pronotal spots small, occupying one-half or less of the anterior dorsal margin of prothorax.

Propodeum with a continuous, moderately broad, deep, median, longitudinal groove, usually margined throughout. Occasionally there is a median longitudinal ruga anteriorly, extending about one-half the length of the groove; rugose within and laterad of groove.

Abdomen long and very slender, plainly longer than head and thorax combined, very narrowly lanceolate; segment 2 between one-sixth and one-seventh the length of the abdomen. Segment 3 is shortest, 5 longest; 6 approaches 5 in length and is usually longer than 4 or 7; segment 7 is never shorter than 4.

Legs: Basal one-half of upper and lower and basal one-third of anterior and posterior faces of front, basal one-half of middle and basal two-thirds of hind femora, black to fuscous; middle and hind tibiae fuscous, front tibiae and knees testaceous.

Antennae: First funicle plus ring-joint equals pedicel in length; scape exclusive of base equals pedicel plus first 2 joints of funicle; fifth funicle joint quadrate and first and second club joints broad as long; club slightly broader than 3 preceding joints. Scape black.

Species medium to large in size.

Male (pl. 46, fig. 12).—Length 2.25 mm. Praescutum same as in female. Pronotal spots visible from above, occupying nearly one-third of anterior dorsal margin of prothorax.

Propodeum coarsely rugose, with a distinct median groove.

Petiole about twice as long as broad; about the same length as hind coxae and granulose; slightly constricted just back of anterior margin, which is slightly enlarged.

Legs: Knees, front tibiae, and distal half of front femora brownish, remaining parts black.

Antennae: Flagellum with pedicel shorter than head and thorax combined. Scape as seen in lateral profile about same width throughout and about 8 times as long as broad, exclusive of base; no shoulder distally; about same width or narrower than first flagellar joint.

Type-locality—Charlottesville, Virginia.

Type—Cat. No. 21759, U.S.N.M.

Described from many females reared in cages under artificial conditions and from specimens reared from stems of species of *Festuca* collected at Penn Yan, New York, Youngstown, Ohio, and Staunton, Virginia.

This species makes conspicuous hardened enlargements or galls in the second to fourth internode from the base of the plants. It breeds only in species of *Festuca* and is normally thelytokous, males rarely occurring.

HARMOLITA VAGINICOLA Doane.

Plate 41, fig. 3; plate 43, fig. 13; plate 46, fig. 13.

Isosoma vaginicolum DOANE, Journ. Econ. Ent., vol. 9, No. 4, p. 398, Aug. 1916.

Female.—Praescutum rugulose. Pronotal spots small, occupying about one-half or less of the anterior dorsal margin of prothorax.

Propodeum with a distinct, very broad, shallow, margined, median, longitudinal groove. Groove broadest near center; marginal carinae are frequently interrupted; floor of groove with an occasional ruga in the anterior one-third to one-half; posteriorly usually quite rugose; propodeum rugose laterad of the groove. No distinct spiracular carinae. Fimbria prominent.

Abdomen longer than head and thorax combined; segment 2 about one-fifth the length of the abdomen exclusive of 1; 4, 5, 6, and 7 are subequal, though 4 is usually longer than 6.

Legs: Knees, distal half of upper and two-thirds of lower face of front femora, and front tibiae testaceous; basal half of front femora, middle and hind femora, and tibiae black, though occasionally the middle and hind tibiae appear slightly fuscous.

Antennae: First funicle plus ring-joint distinctly longer than pedicel. All of funicle and club joints distinctly longer than broad; the club slightly broader than the 3 preceding joints. Scape brownish.

Species medium in size.

Male.—Unknown.

Redescribed from many females reared in cages under artificial conditions; from specimens reared from galls in wheat stubble that

was collected from several localities in New York, Ohio, Pennsylvania, also from Michigan and Salt Lake City, Utah; from specimens identified for the writers by Prof. R. W. Doane; from specimens in the Harris collection of the Boston Society of Natural History that were collected in Virginia in 1852 and labeled *Isosoma tritici*; from five specimens in the United States National Museum collection bearing the label, Verdun, Ontario, Canada; also five females in the National Museum collection labeled with the manuscript name, "*Pteromalus hordei* Harris" from Virginia, numbered 3786 to 3790. This shows conclusively that this species was often confused by earlier writers with *I. tritici*, and if all the old types were in existence it would undoubtedly be found that some represent this species.

This species is a gall former, making a conspicuous hardened enlargement in the sheath surrounding the head of wheat. The head rarely grows out of the sheath and rarely does the head develop any grain. It breeds only in wheat and is normally thelytokous, males never having been observed.

HARMOLITA SECALIS Fitch.

Plate 41, fig. 7; plate 43, fig. 12; plate 46, figs. 5, 14.

Eurytoma secale FITCH, Amer. Agr., vol. 20, p. 236, Aug., 1861.

Isosoma secale (Fitch) HOWARD, U. S. Dept. Agr., Div. Ent., Bull. tech. ser. No. 2, p. 19, 1896.

Female.—Praescutum rugulose. Pronotal spots range from small to large, occupying less than one-half to two-thirds anterior dorsal margin of prothorax.

Propodeum with a very broad, shallow, median, longitudinal groove. Groove broadest near the center, rarely distinctly margined posteriorly; usually granulose within and laterad of groove; sometimes quite rugose laterad of groove; low cross rugae sometimes within the groove; spiracular carinae usually interrupted, low and indistinct; fimbria prominent.

Abdomen equal to or slightly longer than head and thorax combined; segment 2 about one-fifth the length of abdomen exclusive of 1; 3 shortest, 5 longest; 4, 6, and 7 subequal; 4 may be either longer or shorter than 6 or 7.

Legs: Femora in basal one-half to two-thirds and middle tibiae fuscous; front tibiae, knees, and hind tibiae testaceous; middle tibiae as a rule are a shade darker.

Antennae: First funicle plus ring joint equal to or slightly longer than pedicel; all joints of funicle and club distinctly longer than broad; club narrower than the 3 preceding joints. Scape black.

Species medium to large in size.

Male (pl. 46, fig. 5).—Praescutum same as in female. Pronotal spots minute, scarcely visible from above.

Propodeum without groove and rugose.

Petiole about one-half the length of hind coxae and with low rugae.

Legs: Femora black, except at knees; tibia dusky; knees testaceous.

Antennae: Flagellum with pedicel shorter than head and thorax combined; scape as seen in lateral profile about same width throughout and same width as first flagellar joint; very slight shoulder distally; scape, exclusive of base, one-fifth as broad as long.

Redescribed from many females reared in cages under artificial conditions, and from specimens reared from galls in rye stubble collected at Warsaw and La Fayette, Indiana, and from the types in the United States National Museum.

This species makes conspicuous hardened enlargements of galls usually in the second or third internodes from the base of the plant. It breeds only in rye and is normally thelytokous. Males very rarely occur.

HARMOLITA HESPERUS, new species.

Plate 40, fig. 4; plate 44, fig. 5; plate 46, fig. 15; plate 47, fig. 3.

Female.—Length 3.75 mm. Praescutum rugulose. Pronotal spots large, occupying two-thirds or more of anterior dorsal margin of prothorax.

Propodeum with a narrow, deep, median, longitudinal groove; marginal carinae very often interrupted and irregular, and there are numerous cross rugae within the groove; area laterad of groove very rugose. Fimbria very inconspicuous.

Abdomen distinctly longer than head and thorax combined; segment 2 from one-fifth to one-fourth the length of the abdomen exclusive of 1; 3 shortest, 5 longest; 4 and 7 subequal; 6 usually longer than either 4 or 7.

Legs: Front femora, distal two-thirds of middle and one-half of hind femora, and all tibiae translucent reddish-brown; basal part of middle and hind femora fuscous.

Antennae: First funicle plus ring-joint distinctly longer than pedicel; none of funicle or club joints quadrate; club joints same width as fifth funicle; scape dusky to black.

Species medium to very large in size.

Male (pl. 47, fig. 3).—Length 2.5 mm. Praescutum same as in female. Pronotal spots occupying one-third to one-half anterior dorsal margin of prothorax and are often obscure.

Propodeal groove deep and usually well defined throughout. Propodeum very rugose.

Petiole about same length as hind coxae; finely rugose to granulose.

Legs: Front legs, tibiae, distal two-thirds of middle femora and sometimes apical one-third of hind femora reddish-brown; occasion-

ally the middle femora are reddish-brown throughout; basal one-third of middle and basal two-thirds of hind femora are dusky.

Antennae: Flagellum and pedicel slightly longer than head and thorax combined; scape in lateral profile slightly broader than first flagellar joint; slightly broader at distal extremity, where there is a distinct shoulder; one-third as broad as long exclusive of base.

Type-locality.—Holliday, Utah.

Type.—Cat. No. 21760, U.S.N.M.

Described from many females and males reared from stems of species of *Elymus* collected in Utah by Mr. T. H. Parks, the Dakotas, Nebraska, and Kansas, by Mr. George I. Reeves.

This species is a gall former, making galls in species of *Elymus* very much like those of *H. rufipes*. It has only been reared from species of *Elymus*. Males normally occur.

HARMOLITA AGROPYROCOLA, new species.

Plate 41, fig. 2; plate 44, fig. 9; plate 45, fig. 9.

Female.—Length 3.0 mm. Praescutum rugulose. Pronotal spots large, occupying one-half to two-thirds anterior dorsal margin of prothorax.

Propodeum with continuous, deep, narrow, margined, median, longitudinal groove; floor of groove in anterior region sometimes almost smooth but with numerous cross rugae in the posterior region; very rugose laterad of groove.

Abdomen slightly longer than head and thorax combined; segments vary in length.

Legs: All tibiae, front femora (except occasionally in basal region) and distal one-half to one-fourth of middle and hind femora reddish-brown; basal portion of femora dusky.

Antennae: First funicle plus ring-joint about equal in length to pedicel; fifth funicle joint about as broad as long as seen dorsally; club slightly broader than funicle and first 2 joints as broad as long; scape black.

Species medium sized.

Males.—Unknown.

Type-locality.—Salt Lake City, Utah.

Type.—Cat. No. 21761, U.S.N.M.

Described from five females reared from stems of species of *Agropyron* collected near Salt Lake City, Utah, by Mr. Desla Bennion. This species is a gall former in species of *Agropyron*. Males have never been observed.

HARMOLITA OVATA, new species.

Plate 40, fig. 3; plate 44, fig. 7; plate 45, fig. 5; plate 48, fig. 3.

Female.—Length 3.0 mm. Praescutum rugulose. Pronotal spots large, occupying two-thirds anterior dorsal margin of prothorax.

Propodeum with a deep, narrow, margined, median, longitudinal groove, which is narrower posteriorly; the marginal carinae much more prominent anteriorly and the groove often without rugae anteriorly; very rugose laterad of groove.

Abdomen broadly ovate and equal in length to head and thorax combined, though at first glance it may appear shorter; segment 2 about one-fourth the length of the abdomen exclusive of segment 1; 3 usually shortest and 5 longest; 3, 6, and 7 sometimes equal in length; 4 never shorter than 6 or 7; 6 and 7 usually equal.

Legs: Basal one-third to one-half of upper and lower faces of front femora dusky, anterior and posterior faces testaceous to reddish-brown; basal one-half to two-thirds of middle and basal two-thirds of hind femora fuscous; the remaining portions of femora and all tibia reddish-brown. Sometimes the front femora show very little duskiness.

Antennae: First funicle plus ring-joint about equal in length to pedicel; fourth funicle joint quadrate and fifth slightly broader than long; first 2 club joints quadrate; club only slightly broader than funicle. Scape black.

Species medium sized.

Male (pl. 48, fig. 3).—Length, 2 mm. Praescutum same as in female. Pronotal spots occupying one-third to one-half anterior dorsal margin of prothorax.

Propodeal groove deep anteriorly, complete; propodeum rugose within and laterad of groove.

Petiole about same length as hind coxae and is granulose.

Legs: Hind and middle femora black except at knees; front femora dusky to black except at knees; hind and middle tibiae dusky to black; front tibiae dusky to reddish-brown; knees testaceous.

Antennae: Flagellum and pedicel longer than head and thorax combined; scape as seen in lateral profile the same width throughout with a slight shoulder near the distal extremity; about same width as first funicle joint; one-fourth as broad as long, exclusive of base.

Type-locality.—Wellington, Kansas.

Type.—Cat. No. 21762, U.S.N.M.

Described from 10 females and 7 males reared from species of *Elymus* collected at Wellington, Kansas, by Mr. E. O. G. Kelly. It forms galls and has been reared only from species of *Elymus*.

HARMOLITA ELYMOXENA, new species.

Plate 39, fig. 6; plate 44, fig. 12; plate 45, fig. 1; plate 46, fig. 3.

Female.—Length 2.5 mm. Praescutum rugulose, Pronotal spots large, occupying two-thirds anterior dorsal margin of prothorax; usually dull and obscure.

Propodeum with a complete, narrow, shallow, margined, median, longitudinal groove, often much broader anteriorly; area laterad of groove very rugose, quite flat.

Abdomen equal to or slightly longer than head and thorax combined; segments vary considerably in length: fifth longest, 3 usually shortest.

Legs: Three-fourths of the upper and lower faces of front femora pale fuscous; middle and hind legs, except at knees, fuscous; front tibiae, lateral faces of front femora, and all knees luteous to testaceous.

Antennae: First funicle plus ring-joint slightly longer than pedicel; fifth funicle and first 2 club joints usually about quadrate. Scape black.

Species medium sized.

Male (pl. 46, fig. 3).—Length, 2 mm. Praescutum as in female. Pronotal spots obscured and may vary from not visible from above to visibly occupying one-third to one-half the anterior dorsal margin of prothorax.

Propodeum usually with a complete groove and may be either rugose or granulose within and laterad of groove.

Petiole one and one-half times as long as broad and about two-thirds length of hind coxae.

Legs fuscous except distal one-third of front femora and knees, which are testaceous; occasionally the front tibiae are testaceous.

Antennae: Flagellum with pedicel shorter than head and thorax combined; scape distinctly broader than first flagellar joint; one-third as broad as long in broadest place, exclusive of base, and has a distinct shoulder near distal extremity.

Type-locality.—Santa Cruz Mountains, California.

Type.—Cat. No. 21763, U.S.N.M.

Described from many females and males in the United States National Museum that were collected in California, under No. 4255, bearing the label "Reared from *Elymus americanus*"; also from specimens No. 547 that were collected in the Santa Cruz Mountains, California. All of these specimens were collected by Mr. Albert Koebele. As previously stated there are many males and females among this material.

HARMOLITA ELYMICOLA, new species.

Plate 40, fig. 9; plate 44, fig. 10; plate 45, fig. 4; plate 48, fig. 2.

Female.—Length, 3 mm. Praescutum rugulose. Pronotal spots very large, occupying about three-fourths anterior dorsal margin of prothorax.

Propodeum with a continuous, median, longitudinal groove, which may be either rather broad and shallow or narrow and deep, but always distinctly broader anteriorly; when groove is narrow and

deep the middle and hind legs are very black. Propodeum usually granulose within and laterad of groove; sometimes rugose laterad of groove; cross rugae inconspicuous in anterior portion of groove.

Abdomen equal to or longer than head and thorax combined; segment 2 equals one-fifth to one-fourth the length of the abdomen exclusive of segment 1; 3 shortest; 4 to 7 vary greatly in length.

Legs: Basal one-half of upper faces of front, basal one-third of lower and basal two-thirds of upper faces of middle and the hind femora and middle and hind tibiae fuscous; front tibiae, all knees, and other portions of femora tectaceous.

Antennae: First funicle plus ring-joint longer than pedicel; none of the joints are quadrate; club slightly broader than the three preceding segments. Scape black.

Species medium to large in size.

Male (pl. 48, fig. 2).—Length, 2.5 mm. Praescutum as in female. Pronotal spots occupying one-half to two-thirds anterior dorsal margin of prothorax, and usually bright.

Propodeal groove deep anteriorly, generally complete; propodeum either granulose or rugose laterad of groove and within the posterior part of the groove.

Petiole not quite as long as hind coxae; granulose.

Legs: Front femora piceous in basal half; hind and middle legs piceous except at knees; front tibiae dusky to reddish-brown.

Antennae: Flagellum with pedicel about same length as head and thorax combined; scape distinctly broadest in distal half and near the distal extremity there is a distinct shoulder; distinctly broader than first flagellar joint; one-third as wide as long, exclusive of base.

Type-locality.—La Fayette, Indiana.

Type.—Cat. No. 21764. U.S.N.M.

Described from many females and males reared in cages under artificial conditions and from specimens reared from stems of species of *Elymus* collected in Indiana and Virginia.

This species makes very conspicuous galls usually at the second or third internode from the base of the plant and breeds only in species of *Elymus*. It has proven to be arrhenotokous under control conditions, but in nature both sexes regularly occur.

HARMOLITA ATLANTICA, new species.

Plate 39, fig. 1; plate 43, fig. 15; plate 46, figs. 2, 4.

Female.—Length 3 mm. Praescutum rugolose. Pronotal spots large, occupying about two thirds anterior dorsal margin of prothorax; often obscure or dull.

Propodeum with, rarely without, a continuous, broad, shallow, median, longitudinal groove; groove often margined only in its anterior half, though just as often it has marginal carinae through-

out its entire length; propodeum rugose within and laterad of groove, though occasionally granulose; when without groove or when there is only a trace of groove the propodeum is granulose; groove usually broadest near center; entire floor of groove is rugose.

Abdomen quite slender, longer than head and thorax combined; second segment from one-fourth to one-fifth the length of the abdomen, exclusive of 1; 3 shortest, 5 longest; 4, 6, and 7 subequal; rarely 6 equals 5.

Legs: Basal one-third of all faces and two-thirds of upper face of front femora blackish, middle and hind legs black; front tibiae testaceous to dusky; knees testaceous.

Antennae: First funicle plus ring-joint as long as pedicel; segment 4 of funicle usually quadrate, rarely longer than broad; 5 often longer than broad; club joints scarcely quadrate. Scape black to brownish.

Species small to medium in size.

Male (pl. 46, fig. 2).—Length 1.5 mm. Praescutum as in female. Pronotal spots small, scarcely visible from above.

Propodeum granulose or rugose, with or without groove.

Petiole granulose, longer than wide, but not twice as long, about equal in length to hind coxae.

Legs black, except at knees, which are dusky brown; ventral surface of front femora and front tibiae dusky brown.

Antennae: Flagellum with pedicel equal to or shorter than head and thorax combined; scape as seen in lateral profile about same width throughout and about four times as long as broad, exclusive of base; about same width as first flagellar joint; there is a distinct shoulder near distal extremity.

Type-locality.—Penn Yan, New York.

Type.—Cat. No. 21765, U.S.N.M.

Described from many females reared in cages under artificial conditions, and from specimens reared from stems of species of *Agropyron* collected in New York, Pennsylvania, Ohio, Indiana, and Michigan.

This species breeds only in species of *Agropyron*, in which it forms galls that are usually inconspicuous, but occasionally the galls are formed in the sheath that surrounds the head very much the same as the galls of *H. vaginicola*. *H. atlantica* is normally thelytokous, males rarely occurring.

HARMOLITA ELYMOPHILA, new species.

Plate 41, fig. 1; plate 44, fig. 4; plate 45, fig. 8; plate 47, fig. 10.

Female.—Length, 3.0 mm. Praescutum rugulose. Pronotal spots very large, occupying three-fourths anterior dorsal margin of prothorax; they diffuse somewhat, giving the prothorax a brownish tint dorsally and laterally.

Propodeum with a complete narrow, shallow, margined, median, longitudinal groove; marginal carinae very weak; groove almost smooth or quite rugose; laterad of groove usually quite convex and rugose, though occasionally granulose. The propodeum often has a brownish tint.

Abdomen slightly longer than head and thorax combined; it usually has a brownish tinge throughout; segment 5 longest; 4 usually longer than 6; 3 usually shorter than 4 or 7; 7 usually shorter than either 4 or 6.

Legs: Three-fourths of upper and lower faces of front femora pale fuscous; middle and hind legs, except at knees, fuscous; front tibiae, lateral faces of front femora and all knees luteous to testaceous.

Antennae: First funicle plus ring-joint about same length as pedicel; fifth joint of funicle quadrate except in few specimens; first two joints of club usually quadrate. Scape black.

Species medium in size.

Male (pl. 47, fig. 10).—Length, 2 mm. Praescutum as in female. Pronotal spots usually large, occupying about two-thirds anterior dorsal margin of prothorax; often somewhat obscure or dull, giving the anterior margin a brownish tint.

Propodeal groove usually complete; propodeum rugose except when groove is incomplete, in which case it is granulose.

Petiole shorter than hind coxae and about one and one-half times as long as broad.

Legs black except knees and distal portion of front femora (more especially on anterior faces) which are testaceous; sometimes legs are brownish-black; front tibiae usually dusky.

Antennae: Flagellum with pedicel equal to or shorter than head and thorax combined; scape distinctly broadest near distal extremity where there is a very prominent shoulder; scape distinctly broader than first flagellar joint. Scape, exclusive of base, three times as long as broad.

Type-locality.—Alameda, California.

Type.—Cat. No. 21766, U.S.N.M.

Described from many females and males in the United States National Museum that were collected in Alameda County, California, by Mr. Albert Koebele and bear his numbers 396 and 407. It makes inconspicuous galls in species of *Elymus*. Males normally occur.

HARMOLITA POOPHILA, new species.

Plate 41, fig. 9; plate 44, fig. 13; plate 46, fig. 6; plate 47, fig. 5.

Female.—Length, 2.5 mm. Praescutum rugulose. Pronotal spots large, occupying one-half to two-thirds anterior dorsal margin of prothorax.

Propodeum with narrow, deep, margined, median, longitudinal groove, which contains numerous cross rugae; propodeum very rugose laterad of groove.

Abdomen equal to head and thorax combined; segment 2 about one-fifth to one-fourth length of abdomen exclusive of 1; 3 shortest, 5 longest; 6 longer than either 4 or 7.

Legs: Basal half of upper and lower faces of middle and front, basal two-thirds of hind femora dusky to fuscous; front tibiae, and often portions of femora, and knees testaceous; middle and hind tibiae dusky to fuscous.

Antennae: First funicle plus ring-joint about equal to pedicel in length; none of funicle or club joints quadrate. Club about the same width as the three preceding joints. Scape black.

Species about medium in size.

Male (pl. 46, fig. 6).—Length, 2.25 mm. Praescutum as in female. Pronotal spots occupying one-third or less of anterior dorsal margin of prothorax, usually obscure or dull.

Propodeal groove narrow and deep throughout with marginal carinae and with several cross rugae within groove. Propodeum rugose to granulose laterad of groove.

Petiole equal in length to hind coxae and granulose.

Legs: Hind femora black; front and middle femora dusky in basal half; hind and middle tibiae dusky to black; front tibiae and knees testaceous.

Antennae: Flagellum with pedicel equal to or slightly shorter than head and thorax combined. Scape approximately same width throughout, with only a slight shoulder near the distal extremity; about four times as long as broad, exclusive of base.

Type-locality.—Husted, Colorado.

Type.—Cat. No. 21767, U.S.N.M.

Described from 4 females and 16 males that were reared from galls in *Poa lucida*. The stems bearing these galls were collected near Husted, Colorado, by Dr. A. D. Hopkins.

HARMOLITA ELYMIVORA, new species.

Plate 40, fig. 2; plate 44, fig. 3; plate 45, fig. 13; plate 47, fig. 9.

Female.—Length 3.4 mm. Praescutum rugulose. Pronotal spots large, occupying about two-thirds anterior dorsal margin of prothorax.

Propodeum with a continuous, narrow, deep, margined, median, longitudinal groove, marginal carinae irregular and often broken; propodeum rugose within and laterad of groove.

Abdomen longer than head and thorax combined; vertical diameter of sixth segment only slightly less than its greatest vertical diameter; second abdominal segment from one-sixth to one-fifth length of the

abdomen; 3 shortest, 5 usually longest; 4, 6, and 7 subequal; 6 rarely shorter than 4 or 7, usually longer than either.

Legs: Basal two-thirds of upper and basal one-third of lower faces of front, basal one-half of middle femora, middle and hind tibiae fuscous; hind femora fuscous to piceous; front tibiae and all knees testaceous to dusky.

Antennae: First funicle plus ring-joint longer than pedicel; all funicle joints usually longer than broad; club joints also usually longer than broad and only slightly wider than funicle. Scape black. Species medium to large in size.

Male (pl. 47, fig. 9).—Length, 2.0 mm. Praescutum as in female. Pronotal spots occupy about one-half anterior dorsal margin of prothorax, occasionally, however, scarcely visible from above.

Propodeal groove deep, complete. Propodeum very rugose within and laterad of groove.

Petiole about same length as hind coxae and rugose to granulose.

Legs: Hind and middle femora fusco-piceous except at knees; front femora fuscous in basal half; hind and middle tibiae fuscous to dusky; front tibiae and knees reddish-brown.

Antennae: Flagellum with pedicel equal to or longer than head and thorax combined. Scape distinctly broadest in distal half and there is a distinct shoulder near the distal extremity; about same width as first flagellar joint in lateral profile; a little over three times as long as broad, exclusive of base.

Type-locality.—Charlottesville, Virginia.

Type.—Cat. No. 21768, U.S.N.M.

Described from many females and males reared in cages under artificial conditions and from specimens reared from stems of species of *Elymus* collected in Arkansas, Kansas, Illinois, Indiana, Ohio, and in Virginia. It makes inconspicuous galls near the head of species of *Elymus*. Males normally occur.

HARMOLITA ELYMOPHTHORA, new species.

Plate 40, fig. 5; plate 44, fig. 14; plate 46, fig. 10; plate 47, fig. 2.

Female.—Length 3.25 mm. Praescutum rugulose. Pronotal spots large to very large, occupying two-thirds to three-fourths anterior dorsal margin of prothorax, sometimes dull.

Propodeum with a continuous, moderately narrow, deep, median, longitudinal groove, usually margined throughout, though sometimes only in the anterior one-half; very rugose laterad of groove and in the posterior half of groove; anterior half of groove almost smooth, though it may be slightly granulose; groove usually much narrower in posterior half.

Abdomen longer than head and thorax combined; segment 2 from one-sixth to one-fifth the length of the abdomen; 3 shortest, 5 longest; 4, 6, and 7 subequal; segment 4 usually not shorter than 7.

Legs: Basal half of middle and basal two-thirds of hind femora black; middle tibiae black to dusky; hind tibiae reddish-brown to dusky; front femora may be dusky in basal half, but are usually reddish-brown throughout; front tibiae and all knees may vary from testaceous to reddish-brown.

Antennae: First funicle plus ring-joint distinctively longer than pedicel; none of joints quadrate; club about same width as three preceding joints. Scape black.

Species medium to large in size.

Male (pl. 47, fig. 2).—Length 2.25 mm. Praescutum as in female. Pronotal spots occupy one-third to one-half anterior dorsal margin of prothorax and often faint or obscure.

Propodeal groove deep anteriorly, often disappearing posteriorly, being obscured by rugae; floor of groove often smooth anteriorly; propodeum usually rugose but occasionally granulose.

Petiole granulose, about same length as hind coxae.

Legs: Hind and middle femora black except at knees, sometimes only in basal half of middle femora; front femora dusky to black on dorsal face and remaining parts reddish-brown; hind and middle tibiae brownish to black; front tibiae reddish-brown.

Antennae: Flagellum with pedicel about the same length as head and thorax combined; first segment of flagellum not so wide as distal end of scape, as seen in lateral profile. Scape distinctly broadest in distal half, where there is a distinct shoulder; one-third as broad as long, exclusive of base.

Type-locality.—Minot, North Dakota.

Type.—Cat. No. 21769, U.S.N.M.

Described from many females and males reared from stems of species of *Elymus*, collected in Minot, North Dakota, by Mr. C. N. Ainslie, and from points in Nebraska collected by Mr. George I. Reeves. It forms galls in the stems of species of *Elymus* and has not been reared from any other grass. Males normally occur.

HARMOLITA OCCIDENTALIS, new species.

Plate 41, fig. 8; plate 44, fig. 8; plate 45, fig. 2; plate 46, fig. 1.

Female.—Length 2.5 mm. Praescutum regulose. Pronotal spots large, occupying about two-thirds anterior dorsal margin of prothorax.

Propodeum with a continuous, narrow, deep, margined, median, longitudinal groove; propodeum usually granulose, occasionally rugose, and either convex or flat laterad of groove.

Abdomen longer than head and thorax combined; second abdominal segment one-fifth the length of the abdomen; segment 3 shortest,

5 longest; 4, 6, and 7 subequal; abdomen as seen dorsally as broad in the sixth segment as in the third; sides of abdomen nearly parallel to the sixth segment.

Legs: Basal half of front femora, middle and hind legs fuscous; front tibiae testaceous to dusky, knee testaceous.

Antennae: First funicle plus ring-joint equal to pedicel; none of funicle or club joints quadrate; club slightly broader than the three preceding joints. Scape black.

Species small in size.

Male (pl. 46, fig. 1).—Length 1.9 mm. Praescutum as in female. Pronotal spots distinctly visible from above, occupying one-third of anterior dorsal margin of prothorax.

Propodeum with a distinct shallow, narrow groove; granulose, rarely rugose, laterad of groove.

Petiole about three-fourths of the length of hind coxae, granulose.

Legs: Basal half of front, middle and hind femora fuscous to black; middle and hind tibiae fuscous; front tibiae and knees testaceous to dusky.

Antennae: Flagellum with pedicel about same length as head and thorax combined; scape as seen in lateral profile broadening distally with a sloping shoulder; scape one-third as broad as long in widest place, exclusive of base; much broader than first flagellar joint.

Type-locality.—Koehler, New Mexico.

Type.—Cat. No. 21770, U.S.N.M.

Described from many females and males reared from stems of species of *Agropyron* collected in New Mexico by Mr. V. L. Wildermuth and in Kansas by Mr. E. O. G. Kelly. It makes inconspicuous galls near the head of species of *Agropyron* and has not been reared from any other grass. Males normally occur.

HARMOLITA GILLETTEI, new species.

Plate 41, fig. 6; plate 44, fig. 11; plate 45, fig. 3.

Female.—Length 2.5 mm. Praescutum rugulose. Pronotal spots large, well defined, occupying about two-thirds anterior dorsal margin of prothorax.

Propodeum with a continuous, median, narrow, deep, longitudinal groove which is margined throughout and deeper anteriorly; floor of groove usually more or less smooth in anterior half and with cross rugae in posterior half; propodeum rugose laterad of groove and granulose between the rugae.

Abdomen longer than head and thorax combined; segments 3 and 7 about equal in length and each shorter than 4, 5, or 6; 4 and 6 equal in length.

Legs: Basal one-half to two-thirds of front femora dusky to almost black; middle and hind femora brownish-black to black; distal por-

tion of front femora, knees, and front tibiae luteous to testaceous; middle tibiae black and hind tibiae pale fuscous.

Antennae: First funicle plus ring-joint equal to or slightly longer than pedicel; none of funicle or club joints quadrate; club about same width as three preceding joints. Scape black.

Species medium to large and rather robust.

Males.—Unknown.

Type-locality.—Glenwood Springs, Colorado.

Type.—Cat. No. 21771, U.S.N.M.

Described from seven females in the United States National Museum. They were collected near Glenwood Springs, Colorado, by Mr. C. P. Gillette. Host plant unknown.

As previously stated in this paper, the writers have, by restricting the genus *Harmolita*, excluded the following species: *hageni* Howard, *bromi* Howard, *californicum* Howard, *abnorme* Ashmead, *montanum* Ashmead, and *nevadense* Ashmead. They have also dropped *Decatoma basilaris* Provancher from the synonymy as the types apparently cease to exist, Provancher himself in 1888¹ having thrown the species into synonymy under *hordei* Harris. Howard gave it as a synonym of *tritici* Fitch in 1896.²

EXPLANATION OF PLATES.

PLATE 39.

- FIG. 1=ovipositor of *H. atlantica*.
2=ovipositor of *H. websteri*.
3=ovipositor of *H. elymi*.
4=ovipositor of *H. grandis* form *grandis*.
5=ovipositor of *H. grandis* form *minuta*.
6=ovipositor of *H. clymoxena*.
7=ovipositor of *H. agropyrophila*.
8=ovipositor of *H. maculata*.
9=ovipositor of *H. captiva*.
10=ovipositor of *H. poae*.

PLATE 40.

- FIG. 1=ovipositor of *H. rufipes*.
2=ovipositor of *H. clymivora*.
3=ovipositor of *H. ovata*.
4=ovipositor of *H. hesperus*.
5=ovipositor of *H. clymophthora*.
6=ovipositor of *H. bromicola*.
7=ovipositor of *H. dactylicola*.
8=ovipositor of *H. albomaculata*.
9=front and profile view of the ovipositor of *H. clymicola*.

¹ Prov. Addit faun. Can. Hym., p. 438, 1888.

² U. S. Dept. Agr., Div. Ent., Bull. tech. ser. No. 2, p. 18, 1896.

PLATE 41.

- FIG. 1=ovipositor of *H. elymophila*.
 2=ovipositor of *H. agropyrocola*.
 3=ovipositor of *H. vaginicola*.
 4=ovipositor of *H. tritici*.
 5=ovipositor of *H. hordei*.
 6=ovipositor of *H. gilletti*.
 7=ovipositor of *H. secalis*.
 8=ovipositor of *H. occidentalis*.
 9=ovipositor of *H. poophila*.
 10=ovipositor of *H. festucae*.

All illustrations in plates 39, 40, and 41 are drawn to the same scale and greatly enlarged.

PLATE 42.

- FIG. 1=*H. tritici*; illustrating the sculpturing of the praescutum of the gall-forming species.
 FIG. 2=*H. maculata*; illustrating the sculpturing of the praescutum of the species that occupy the center of the stem in various plants.
 Illustrations greatly enlarged.

PLATE 43.

- FIG. 1=propodium of the female of *H. agrostidis*.
 2=propodium of the female of *H. websteri*.
 3=propodium of the female of *H. albomaculata*.
 4=propodium of the female of *H. albomaculata*.
 5=propodium of the female of *H. captiva*.
 6=propodium of the female of *H. poae*.
 7=propodium of the female of *H. dactylicola*.
 8=propodium of the female of *H. elymi*.
 9=propodium of the female of *H. bromicola*.
 10=propodium of the female of *H. maculata*.
 11=propodium of the female of *H. agropyrophila*.
 12=propodium of the female of *H. secalis*.
 13=propodium of the female of *H. vaginicola*.
 14=propodium of the female of *H. festucae*.
 15=propodium of the female of *H. atlantica*.

PLATE 44.

- FIG. 1=propodium of the female of *H. tritici*.
 2=propodium of the female of *H. rufipes*.
 3=propodium of the female of *H. elymivora*.
 4=propodium of the female of *H. elymophila*.
 5=propodium of the female of *H. hesperus*.
 6=propodium of the female of *H. hordei*.
 7=propodium of the female of *H. ovata*.
 8=propodium of the female of *H. occidentalis*.
 9=propodium of the female of *H. agropyrocola*.
 10=propodium of the female of *H. elymicola*.
 11=propodium of the female of *H. gilletti*.
 12=propodium of the female of *H. elymoxena*.
 13=propodium of the female of *H. poophila*.
 14=propodium of the female of *H. elymophthora*.

All illustrations in plates 43 and 44 are drawn to the same scale and greatly enlarged.

PLATE 45.

- FIG. 1=antenna of the female of *H. elymoxena*.
2=antenna of the female of *H. occidentalis*.
3=antenna of the female of *H. gillettei*.
4=antenna of the female of *H. elymicola*.
5=antenna of the female of *H. ovata*.
6=antenna of the female of *H. bromicola*.
7=antenna of the female of *H. agrostidis*.
8=antenna of the female of *H. elymophila*.
9=antenna of the female of *H. agropyrocola*.
10=antenna of the female of *H. festucae*.
11=antenna of the female of *H. captiva*.
12=antenna of the female of *H. tritici*.
13=antenna of the female of *H. elymivora*.
14=antenna of the female of *H. maculata*.
15=antenna of the female of *H. grandis* form *minuta*.
16=antenna of the female of *H. dactylicola*.
17=antenna of the female of *H. albomaculata*.
18=antenna of the female of *H. poae*.
19=antenna of the female of *H. agropyrophila*.
20=antenna of the female of *H. grandis* form *grandis*.
21=antenna of the female of *H. elymi*.

PLATE 46.

- FIG. 1=antenna of the male of *H. occidentalis*.
2=antenna of the male of *H. atlantica*.
3=antenna of the male of *H. elymoxena*.
4=antenna of the female of *H. atlantica*.
5=antenna of the male of *H. secalis*.
6=antenna of the female of *H. poophila*.
7=antenna of the male of *H. rufipes*.
8=antenna of the female of *H. hordei*.
9=antenna of the female of *H. websteri*.
10=antenna of the female of *H. elymophthora*.
11=antenna of the female of *H. rufipes*.
12=antenna of the male of *H. festucae*.
13=antenna of the female of *H. vaginicola*.
14=antenna of the female of *H. secalis*.
15=antenna of the female of *H. hesperus*.

PLATE 47.

- FIG. 1=antenna of the male of *H. poae*.
 2=antenna of the male of *H. elymophthora*.
 3=antenna of the male of *H. hesperus*.
 4=antenna of the male of *H. tritici*.
 5=antenna of the male of *H. poophila*.
 6=antenna of the male of *H. captiva*.
 7=antenna of the male of *H. maculata*.
 8=antenna of the male of *H. agropyrophila*.
 9=antenna of the male of *H. elymivora*.
 10=antenna of the male of *H. elymophila*.

PLATE 48.

- FIG. 1=antenna of the male of *H. grandis* form *minuta*.
 2=antenna of the male of *H. elymicola*.
 3=antenna of the male of *H. ovata*.
 4=antenna of the male of *H. dactylicola*.
 5=antenna of the male of *H. albomaculata*.
 6=antenna of the male of *H. websteri*.
 7=antenna of the male of *H. hordei*.

All illustrations in plates 45, 46, 47, and 48 are drawn to the same scale and greatly enlarged.